RVD2008-33

Re-evaluation Decision

Thifensulfuron-methyl

(publié aussi en français)

8 September 2008

This document is published by the Health Canada Pest Management Regulatory Agency. For further information, please contact:

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ISBN: 978-1-100-10548-2 (978-1-100-10549-9)
Catalogue number: H113-28/2008-33E (H113-28/2008-33E-PDF)

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Overview

Re-evaluation Decision

After a re-evaluation of the herbicide thifensulfuron-methyl, Health Canada's Pest Management Regulatory Agency (PMRA), under the authority of the *Pest Control Products Act* and Regulations, is granting continued registration of products containing thifensulfuron-methyl for sale and use in Canada.

An evaluation of available scientific information found that products containing thifensulfuron-methyl have value in the food and crop industry and do not present unacceptable risks to human health or the environment when used according to revised label directions. As a condition of the continued registration and use of thifensulfuron-methyl, new risk-reduction measures must be included on the labels of all products. No additional data are required at this time.

The regulatory approach for the re-evaluation of rimsulfuron was first presented in Proposed Re-evaluation Decision PRVD2008-03, *Thifensulfuron-methyl*, a consultation document[1]. This Re-evaluation Decision[2] describes this stage of PMRA's regulatory process for re-evaluating thifensulfuron-methyl as well as summarizes the Agency's decision and the reasons for it. Appendix I summarizes the comments received during the consultation process and provides the PMRA's response to these comments. The comments did not result in changes to the proposed re-evaluation decision as stated in PRVD2008-03, *Thifensulfuron-methyl*. To comply with this decision, registrants of products containing thifensulfuron-methyl will be informed of the specific requirements affecting their product registration(s) and of the regulatory options available to them.

For more details on the information presented in this Re-evaluation Decision, please refer to the Science Evaluation in the related Proposed Re-evaluation Decision, PRVD2008-03, *Thifensulfuron-methyl*.

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1 "Consultation statement" as required by subsection 28(2) of the *Pest Control Products Act*.

2 "Decision statement" as required by subsection 28(5) of the *Pest Control Products Act*.

What Does Health Canada Consider When Making a Re-evaluation Decision?

The key objective of the *Pest Control Products Act* is to prevent unacceptable risks to people and the environment from the use of pest control products. Health or environmental risk is considered acceptable[3] if there is reasonable certainty that no harm to human health, future generations or the environment will result from use or exposure to the product under its conditions or proposed conditions of registration. The Act also requires that products have value[4] when used according to label directions. Conditions of registration may include special precautionary measures on the product label to further reduce risk.

To reach its decisions, the PMRA applies rigorous, modern hazard and risk assessment methods and policies. These methods consider the unique characteristics of sensitive segments of the human population (e.g. children) and organisms in the environment (e.g. those most sensitive to environmental contaminants). These methods and policies also consider the nature of the effects observed and the uncertainties when predicting the impact of pesticides. For more information on how the PMRA regulates pesticides and its assessment process and risk reduction programs, please visit the PMRA's website at www.pmra-arla.gc.ca.

What Is Thifensulfuron-methyl?

Thifensulfuron-methyl is a selective systemic sulfonylurea herbicide. It is registered for postemergent use on various food, feed, industrial oilseed and fibre crops including wheat (spring, winter, and durum), barley, flax (CDC Triffid), oats (Prairie provinces and the Peace River region of British Columbia), soybean, field tomato, forage grasses (seedling or established), imazethapyr tolerant canola (Prairie provinces and the Peace River region of British Columbia), and sulfonylurea tolerant soybean (Eastern Canada only).

Thifensulfuron-methyl may be used alone or in co-formulation with tribenuron methyl or chlorimuron ethyl to control a wide spectrum of broadleaf weeds. Application is made once per year at a rate of 3.3 to 15 g a.i./ha by ground equipment only.

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3 "Acceptable risks" as defined by subsection 2(2) of the *Pest Control Products Act*.

4 "Value" as defined by subsection 2(1) of the Pest Control Products Act: "the product's actual or potential contribution to pest management, taking into account its conditions or proposed conditions of registration, and includes the product's (a) efficacy; (b) effect on host organisms in connection with which it is intended to be used; and (c) health, safety and environmental benefits and social and economic impact."

Health Considerations

Can the Approved Uses of Thifensulfuron-methyl Affect Human Health?

Thifensulfuron-methyl is unlikely to affect your health when used according to revised label directions.

People could be exposed to thifensulfuron-methyl by consuming food and water, working as a mixer/loader/applicator or by entering treated sites. The PMRA considers two key factors when assessing health risks: the dose levels where no health effects occur and the dose levels to which people may be exposed. The dose levels used to assess risks are established to protect the most sensitive human population (e.g. children and nursing mothers). Only those uses where exposure is well below levels that cause no effects in animal testing are considered acceptable for continued registration.

Toxicology studies in laboratory animals describe potential health effects from varying levels of exposure to a chemical and identify the dose where no effects are observed. The health effects noted in animals occur at doses more than 100-times higher (and often much higher) than levels to which humans are normally exposed when using thifensulfuron-methyl products according to label directions.

An acute over-exposure to thifensulfuron-methyl can produce a variety of symptoms in animals and humans. Symptoms may include weight loss, diarrhea, yellow-stained perineal area and nasal discharge. Contact with the eye may cause slight corneal opacity and chemosis, mild conjunctivitis and moderate iritis. Contact with the skin may cause slight erythema and edema.

Additional toxic effects include reduced serum sodium and increased relative organ weights. Effects noted at high doses in fetal rats include an increased incidence of absent renal papillae and small renal papillae. However, these effects are not likely to occur when thifensulfuron-methyl products are used according to label directions. Based on the weight of evidence, thifensulfuron-methyl is considered non-carcinogenic. A cancer risk assessment was not required.

Although there are no concerns based on the current uses of thifensulfuron-methyl, some additional protective measures are required on product labels to update the label according to current standards.

Residues in Water and Food

Dietary risks from food and water are not of concern.

Reference doses define levels to which an individual can be exposed over a single day (acute) or lifetime (chronic) and expect no adverse health effects. Generally, dietary exposure from food and water is acceptable if it is less than 100% of the acute reference dose or chronic reference dose (acceptable daily intake). An acceptable daily intake is an estimate of the level of daily exposure to a pesticide residue that, over a lifetime, is believed to have no significant harmful effects.

Human exposure to thifensulfuron-methyl, including to the most highly exposed subpopulation (e.g. children 1 to 6 years old), was estimated from residues in treated food commodities. This dietary exposure represents less than 0.1% of the acute reference dose and less than 5% of the chronic reference dose. Based on Tier I computer modelling of estimated drinking water concentrations (DWECs), exposure that may occur from drinking water is not of concern.

The *Food and Drugs Act* prohibits the sale of adulterated food, that is, food containing a pesticide residue that exceeds the established maximum residue limit (MRL). Pesticide MRLs are established for the *Food and Drugs Act* purposes through the evaluation of scientific data under the *Pest Control Products Act*. Each MRL value defines the maximum concentration in parts per million (ppm) of a pesticide allowed in/on certain foods. Food containing a pesticide residue that does not exceed the established MRL does not pose an unacceptable health risk.

MRLs for thifensulfuron-methyl are currently specified for flax, canola, tomatoes and processed foods derived from these foods. Where no specific MRL has been established, a default MRL of 0.1 ppm applies, which means that pesticide residues in a food commodity must not exceed 0.1 ppm. The proposed amendments to the default MRL for thifensulfuron-methyl can be found in the Science Evaluation Section 8.1.2 of PRVD2008-03, *Thifensulfuron-methyl*.

Risks in Residential and Other Non-Occupational Environments

Residential and other non-occupational risks are not of concern.

Thifensulfuron-methyl is not registered for use in any residential areas. Therefore, no residential or other non-occupational risks are expected.

Occupational Risks From Handling Thifensulfuron-methyl

Occupational risks are not of concern.

Given the precautions and directions for use on the original product labels reviewed for this re-evaluation and the additional protective equipment required, the risk estimates associated with mixing, loading and applying meet current standards for all use scenarios. Therefore, occupational risks are not of concern. The required personal protective equipments are long pants, long-sleeved shirts, socks, chemical-resistant gloves and footwear.

Occupational postapplication risks are not of concern.

Occupational postapplication risk assessments consider exposures to workers re-entering treated sites. Given the precautions and directions for use on the original product labels reviewed for this re-evaluation and the additional protective measures required, (i.e. the personal protective equipment and revised restricted entry interval) the postapplication exposure risk estimate for restricted entry workers performing high exposure activities (i.e. irrigating, scouting, thinning, hand pruning, hand weeding, staking, training, tying and hand harvesting) meet current standards. Therefore, occupational postapplication risks are not of concern.

Environmental Considerations

What Happens When Thifensulfuron-methyl Is Introduced Into the Environment?

Thifensulfuron-methyl poses a potential risk to terrestrial and aquatic plants, therefore, additional risk reduction measures must be observed.

When thifensulfuron-methyl is released into the environment some of it can be found in soil and surface water. However, thifensulfuron-methyl is rapidly broken down by soil microbes and by chemical reaction in water and thus is not expected to persist in the environment. Its major transformation products will be present in soil and aquatic systems for a longer period of time. Laboratory studies indicate that thifensulfuron-methyl and its transformation products are mobile in soil. However, there is no field evidence that the use of this herbicide will result in groundwater contamination, most probably due to the rapid microbiological breakdown of thifensulfuron-methyl in soil.

When thifensulfuron-methyl is used for weed control in crops, there is a potential that non-target plant species on land and in water may be exposed to the chemical as a result of spray drift or runoff. Some plant species are sensitive to this chemical and would be adversely affected. To minimize the potential exposure, strips of land between the agricultural field and the non-target terrestrial or aquatic areas will be left unsprayed. The width of these buffer zones will be specified on

the product label. Water monitoring data indicate that thifensulfuron-methyl can occur in runoff. Thifensulfuron-methyl presents a negligible risk to wild birds and mammals, bees and other arthropods as well as to aquatic organisms like fish, amphibians and invertebrates.

Value Considerations

What Is the Value of Thifensulfuron-methyl?

Thifensulfuron-methyl controls a wide spectrum of broadleaf weeds in several major crops.

Thifensulfuron-methyl reduces a portion of the economic losses caused by weeds (estimated at $432 million in the early 1990s for cereal crops, soybean, tomato, and forage grass for seed production). The application rate of thifensulfuron-methyl is much lower (10 to 100 times) than alternative non-sulfonylurea broadleaf herbicides registered for use on the same sites, contributing to smaller chemical load in the environment.

Thifensulfuron-methyl can be tank-mixed with a variety of herbicides and is known for its prepackaged tank mixes. The use claim for thifensulfuron-methyl on imazethapyr tolerant canola and sufonylurea tolerant soybeans may provide an option to deal with emerging resistant weed problems arising from the current widely used herbicide-tolerant crop systems. This product will prove to be a useful precedent for the future development of herbicide tolerant crop systems. However, resistance management must be considered as more weed species are reported to be resistant to herbicides that inhibit acetolactate synthase (such as thifensulfuron-methyl) than to herbicides that have other modes of action.

Measures to Minimize Risk

Labels of registered pesticide products include specific instructions for use. Directions include risk-reduction measures to protect human and environmental health. These directions must be followed by law. As a result of the re-evaluation of thifensulfuron-methyl, the PMRA is requiring further risk-reduction measures for product labels.

Human Health

- Additional protective equipment to protect mixer/loader/applicators
- A restricted-entry interval to protect workers re-entering treated sites
- Additional precautionary statements and directions for use to protect workers using wettable granular and soluble formulations
- Precautionary statements to avoid drift to areas of human habitation or activity

Environment

- Additional precautionary statements and directions for use, as well as buffer zones to protect non-target terrestrial and aquatic plants
- Additional precautionary statements to protect aquatic habitats from use on sites conducive to runoff

Appendix IV lists all required label amendments.

Other Information

For thifensulfuron-methyl, the summary of assessments found in PRVD2008-03 serves as an evaluation report. Lists of references considered by the Agency in support of the registration decision are found in this Re-evaluation Decision. The relevant test data on which the decision is based are available for public inspection, upon application, in the PMRA's Reading Room (located in Ottawa). For more information, please contact the PMRA's Pest Management Information Service by phone (1-800-267-6315) or by e-mail (pmra_infoserv@hc-sc.gc.ca).

Any person may file a notice of objection regarding this decision on thifensulfuron-methyl within 60 days from the date of publication of this Re-evaluation Decision. For more information regarding the basis for objecting (which must be based on scientific grounds), please refer to the PMRA's website (Requesting a Reconsideration of Decision, www.pmra arla.gc.ca/english/pubreg/reconsideration-e.html), or contact the PMRA's Pest Management Information.

Appendix I Comments and Responses

1.0 Comment on Chemical Names

There are errors in names of some transformation products of thifensulfuron-methyl in Appendix IX, PRVD2008-03.

Response

The errors have been corrected in the revised table found in Appendix II.

2.0 Comment on Classification of Thifensulfuron-methyl

The registrant disagreed with PMRA's assessment of developmental toxicity in the rat (DuPont Report No. HLR-146-84) and its findings that thifensulfuron-methyl is teratogenic. PMRA reported the following statement in the Toxicology Summary found in Appendix III of PRVD2008-03.

PMRA Statement

"In a developmental rat toxicity study, the incidence of absent or small renal papillae at the highest dose was greater than in historical controls and was considered treatment-related. The absence of renal papillae is considered a malformation which indicates teratogenicity, while small renal papillae are considered a developmental variation. A decrease in fetal body weight was also considered treatment-related. Given no adverse effects were noted in the dams, these effects indicate a fetal sensitivity."

The registrant submitted a document in response to the PMRA's assessment of and suggested that the study did not warrant classification of thifensulfuron-methyl as teratogenic. In addition, the registrant requested that the PMRA recalculate the reference doses for females 13+.

Response

The PMRA considered the information submitted by the registrant in the response below.

Absent renal papillae: The literature on rat development suggests that an absence of renal papillae in the fetus may be corrected at a later stage leading to a normal outcome, or papillae may never develop resulting in a functional impairment of the urinary system in the adult. In the developmental rat toxicity study, absent renal papillae were observed in the following incidences: 1/1, 1/1, 0/0, and 5/5 (fetuses/litters) for the 0, 30, 200 and 800 mg/kg bw/day groups. DuPont refers to historical control data (10 studies conducted at Haskell Laboratory and reported in 1983, 1984 and 1985) that show an incidence of absent renal papillae in control group litters ranging from 0/0 to 3/3 (fetuses/litters). The incidence of absent papillae at the high dose in the developmental rat toxicity study is, therefore,

higher than in historical controls. DuPont states that "it is impossible to detect the complete absence of papillary tissue without histopathololological confirmation (which apparently was not available in either the developmental rat toxicity study or the historical controls). While histopathological evaluations would have been desirable, it is only possible to go by the evidence at hand.

Small renal papillae: The original historical controls on which the PMRA's analysis was based, were taken from 9 studies conducted in 1983 and 1984 in which 6 studies had fetuses with absent papillae (1–3 fetuses) and 5 studies had fetuses with small papillae (1–3 fetuses). Assuming that these studies are amongst those (10 studies) that DuPont is now referring to, the occurrence of an additional study control with 16/12 (fetuses/litters) with small renal papillae is strikingly at odds with any of the other studies, and requires further explanation (apparently from 1985 the classification of renal papillae was greatly modified making comparisons with earlier data difficult). The developmental rat toxicity study of concern here was performed in 1984 and the increase in small papillae at the high dose exceeds historical controls from the years 1983 and 1984; the increase in small papillae at the high dose was also statistically significant (i.e., 0/0, 0/0, 1/1, 4/4).

The registrant has not sufficiently supported its case that the observed kidney effects (absence of renal papillae, small renal papillae) in the developmental study are not treatment related effects. Therefore, the PMRA's current interpretation and use of these effects will not change. We accept DuPont's analysis that the reduced mean fetal weight is due to a decreased number of male fetuses per litter and the evaluation document will be updated to reflect this change.

In consideration of the above noted change, the safety/uncertainty factors applied to this study were reexamined. In the original assessment the following factor and rationale were applied: because the absence of renal papillae in the fetus would not necessarily be life-threatening, a safety factor of 3× was applied rather than 10×, which would have been applied for a more serious effect. As the principal effect of concern has not changed, this factor and rationale will be maintained.

3.0 Comment on the Terrestrial Buffer Zone

It was pointed out that the terrestrial buffer zone was recalculated according to revised methodology for buffer zone. The terrestrial buffer zone should be changed to 15 meters.

Response

The PMRA agrees that the buffer zone should be changed according to the new methodology in buffer zone modelling. The current buffer zone value for terrestrial environments is 15 meters. The revised buffer zone can be found in a revised table in Appendix IV.

4.0 Comment on Aerial Application

It was noted that the PMRA recently approved aerial application of Refine SG Herbcide (Reg. No. 28285), which contains thifensulfuron-methyl as one of active ingredient. However, PRVD2008-03 stipulated that thifensulfuron-methyl cannot be applied by aerial application.

Response

The PMRA acknowledges that aerial application of Refine SG Herbicide was assessed and approved recently, after the publication of PRVD2008-03. The re-evaluation of thifensufuron methyl considered only those products that were registered as of 27 June 2006; see Appendix III.

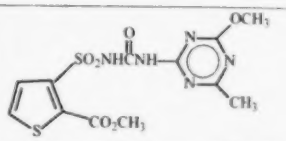
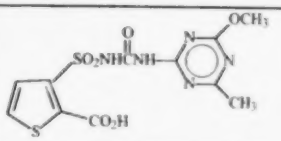
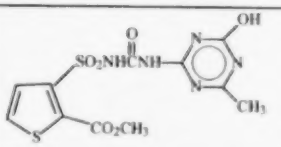
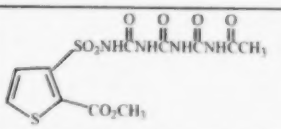
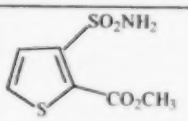
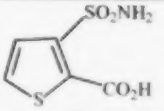
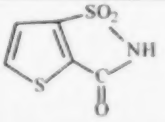
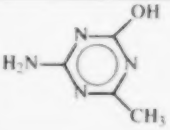
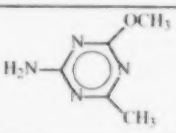
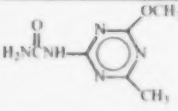
5.0 Comment

There is a typographical error (EC_{25} value for plant vegetative vigour) in Table 2 of Appendix X of PRVD2008-03.

Response

The range of EC_{25} for plant vegetative vigour is 0.03–39.7 g ai/ha and not 0.03–52 g ai/ha as found in PRVD2008-03.

Appendix II Major Transformation Products of Thifensulfuron-methyl

thifensulfuron-methyl methyl 3-[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)carbamoyl]sulfamoyl]-2-thiophenecarboxylate CAS # 79277-27-3	
thifensulfuron acid 3-[[(4-methoxy-6-methyl-1,3,5-triazin-2-yl)carbamoyl]sulfamoyl]-2-thiophenecarboxyl CAS # 79277-67-1	
O-desmethylthifensulfuron methyl 3-[[(4-hydroxy-6-methyl-1,3,5-triazin-2-yl)carbamoyl]sulfamoyl]-2-thiophenecarboxylate	
2-ester-3-triuret methyl 3-[[[[(acetylamino)carbonylamino]-carbonylamino]-carbonylamino]sulphonyl]-2-thiophenecarboxylate	
2-ester-3-sulfonamide methyl 3-(aminosulphonyl)-2-thiophenecarboxylate	
2-acid-3-sulfonamide 3-(aminosulphonyl)-2-thiophenecarboxylic acid	
thiophene sulfonimide thieno[2,3-d]isothiazol-3(2H)-one, 1,1-dioxide	
triazine amine 4-hydroxy-6-methyl-1,3,5-triazin-2-amine CAS # 16352-06-0	
O-desmethyl triazine amine 4-methoxy-6-methyl-1,3,5-triazin-2-amine CAS # 1668-54-8	
triazine urea N-(4-methoxy-6-methyl-1,3,5-triazin-2-yl) urea	

Appendix III Registered Thifensulfuron Methyl Products as of 27 June 2006

Registration Number	Marketing Class[1]	Registrant	Product Name	Formulation Type	Guarantee (%)[2]		
					MMM	MEX	CHE
21060	T	E.I. du Pont Canada Company	Thifensulfuron Methyl Technical Herbicide	Solid	98	—	—
21059	C		Refine Herbicide Dry Flowable	Wettable granules	75	—	—
21645	C		Plus Dry Flowable Herbicide (Component #1 of Triumph Plus)		75	—	—
22002	C		Pinnacle 75 Toss-N-Go Herbicide		75	—	—
22352	C		Refine Extra 75DF Herbicide		50	25	—
22575	C		Refine Extra Herbicide Toss-N-Go Bags		50	25	—
25444	M		Thifensulfuron Methyl 75DF		75	—	—
25457	M		Refine Extra MUP		50	25	—
25784	C		Reliance STS Toss-N-Go Herbicide		12	—	21
28144	M		Refine Extra 50SG MUP	Soluble granules	33.35	16.65	—

[1] T = Technical active; M = Manufacturing concentrate; C = Commercial.
[2] MMM = thifensulfuron methyl; MEX = tribenuron methyl; CHE = chlorimuron ethyl.

NOTE: Discontinued products or products with a submission for discontinuation are not included.

Appendix IV Revised Label Amendments for Commercial Class Products Containing Thifensulfuron-methyl

Canadian commercial end-use product labels must be amended to include the following statements to further protect workers and the environment.

FOR ALL FORMULATIONS:

Add to **DIRECTIONS FOR USE:**

- Do not re-enter treated fields until 12 hours after application.
- Apply only when the potential for drift to areas of human habitation or areas of human activity (houses, cottages, schools and recreational areas) is minimal. Take into consideration wind speed, wind direction, temperature inversion, application equipment and sprayer settings.
- **DO NOT** apply by air.

Field sprayer application:

- **DO NOT** apply during periods of dead calm. Avoid application of this product when winds are gusty.
- **DO NOT** apply with spray droplets smaller than the ASAE medium classification.

Buffer zones:

Use of the following spray methods or equipment **DO NOT** require a buffer zone: hand-held or backpack sprayer, inter-row hooded sprayer, spot treatment, soil drench, and soil incorporation.

The buffer zones specified in the table below are required between the point of direct application and the closest downwind edge of sensitive terrestrial habitats (such as grasslands, forested areas, shelter belts, woodlots, hedgerows, pastures, rangelands, and shrublands), sensitive freshwater habitats (such as lakes, rivers, sloughs, ponds, prairie potholes, creeks, marshes, streams, reservoirs and wetlands) and estuarine/marine habitats.

Method of application	Buffer zone (metres) required for the protection of:		
	Terrestrial habitat	Aquatic habitats of water depths:	
		< 1 m	> 1 m
Field sprayer*	15	1	0

* For field sprayer application, buffer zones can be reduced with the use of drift reducing spray shields. When using a spray boom fitted with a full shield (shroud, curtain) that extends to the crop canopy, the labelled buffer zone can be reduced by 70%. When using a spray boom where individual nozzles are fitted with cone-shaped shields that are no more than 30 cm above the crop canopy, the labelled buffer zone can be reduced by 30%.

When a tank mixture is used, consult the labels of the tank-mix partners and observe the largest (most restrictive) buffer zone of the products involved in the tank mixture.

Add to **ENVIRONMENTAL HAZARDS:**

- **TOXIC** to plants. Observe buffer zones specified under DIRECTIONS FOR USE.
- To reduce runoff from treated areas into aquatic habitats, consider the characteristics and conditions of the site before treatment. Site characteristics and conditions that may lead to runoff include, but are not limited to: heavy rainfall, moderate to steep slope, bare soil, poorly draining soil (e.g. soils that are compacted or fine textured such as clay).
- Avoid application of this product when heavy rain is forecast.
- Contamination of aquatic areas as a result of runoff may be reduced by including a vegetative strip between the treated area and the edge of the water body.

Add to **PRECAUTIONS:**

- Wear long-sleeved shirt, long pants, socks, and chemical-resistant gloves and footwear during mixing, loading, application, clean-up and repair. Chemical-resistant gloves are not required while operating groundboom sprayers.

FOR WETTABLE GRANULE/SOLUBLE GRANULE FORMULATIONS:

Add to **DIRECTIONS FOR USE:**

- Thifensulfuron-methyl is formulated as a wettable granule or a soluble granule sealed within a water-soluble package (WSP). Drop intact WSP directly into spray tank. The WSP and pesticide will dissolve readily in water.
- Do not allow the WSP to become wet prior to use. Do not handle individual WSP with wet hands or wet gloves as this may cause breakage. Do not remove WSP from over-wrap container except for immediate use.
- Do not use opened or punctured WSP.
- If broken WSP is found when the over-wrap bag is opened, avoid contact with, and inhalation of the product. Handle with chemical-resistant gloves and dispose of broken WSP according to the DISPOSAL section.

FOR FORMULATION PCP Reg. No. 22575:
On the secondary panel of the supplemental label for fall application on winter wheat, the text which reads "FALL APPLICATION ON WINTER WHEAT IN EASTERN CANADA" on page 6 must be revised to read "FALL APPLICATION ON WINTER WHEAT IN ONTARIO ONLY" to correct the inconsistent regional use restrictions.

FOR FORMULATION PCP Reg. No. 22352 and 22575:
The leaf stage for wild buckwheat which reads "cotyledon 1–3 leaf stage" must be revised to read either0 "the cotyledon - 3 leaf stage" or "the 1–3 leaf stage" whichever is correct.

References

Studies considered in the Chemistry Assessment

A. LIST OF STUDIES/INFORMATION SUBMITTED BY REGISTRANT

PMRA Document Number	Reference
1441536	2001, Product Chemistry, Proposed Label Directions, Metabolism in plants and animals, Freezer storage stability, Livestock feeding studies, Processing studies, Confined and field crop rotational studies, Residue decline studies, Analytical methodology, DA
1441524	1997, Product Chemistry, Metabolism of thifensulfuron-methyl, Metabolism of rimsulfuron in corn, Analytical method for thifensulfuron-methyl, Analytical method for rimsulfuron, Thyfensulfuron-methyl residues in corn, Crop rotation, Freezer storage stabili
1441523	1998, Product Chemistry, Plant Metabolism, Livestock Metabolism, Analytical Method, Storage Stability, Processing Study, Feeding Study Thifensulfuron-methyl/quizalofop-P-ethyl, DACO: 2.11,6.2,6.3,7.2,7.2.5,7.4.5,7.4.6
1441522	1987, Review of chemistry, label, analytical methodology, metabolism, residue data and environmental chemistry to support postemergence use on wheat, barley and oats. Metabolism of [Triazine-2-14C] DPX-M6316 in Field-Grown Wheat: Radioactive Residues in M

Studies considered in the Health Risk Assessment

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PMRA Document Number	Reference
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1203776	ACUTE SKIN ABSORPTION LD50 TEST ON RABBITS (EPA PESTICIDE REGISTRATION GUIDELINES), DACO: 4.2.2
1203631	4 - HOUR INHALATION MEDIAN LETHAL CONCENTRATION (LC50) OF INM-6316-22 BY EPA GUIDELINES, DACO: 4.2.3
1203632	EYE IRRITATION TEST IN RABBITS, DACO: 4.2.4
1203633	PRIMARY SKIN IRRITATION AND SENSITIZATION TEST ON GUINEA PIGS, DACO: 4.2.5,4.2.6
1203599	13-WEEK SUBCHRONIC DIETARY STUDIES IN DOGS, DACO: 4.3.1
1203595	90 DAY FEEDING AND 1-GENERATION REPRODUCTION STUDY IN RATS, DACO: 4.3.1
1203777	SUBACUTE ORAL TOXICITY STUDY, CD RATS, DACO: 4.3.1
1203598	TEN DOSE ORAL SUBCHRONIC TEST IN RATS, DACO: 4.3.1
1203594	4-WEEK RANGE FINDING AND 90 DAY FEEDING STUDY IN MICE, DACO: 4.3.3
1203775	LONG-TERM FEEDING STUDY IN MICE WITH INM-6316, DACO: 4.4.1

PMRA Document Number	Reference
1203783	LONG-TERM FEEDING STUDY IN RATS WITH INM-6316, DACO: 4.4.1
1203629	ONE-YEAR FEEDING STUDY IN DOGS WITH H-15172-03, DACO: 4.4.1
1181641	RESPONSES TO CANADIAN QUESTIONS ON INM-6316, LONG-TERM FEEDING STUDY IN RATS, TO J.C. SUMMERS FROM W.J. BROCK, OCTOBER 30, 1986 (HLR-261-86) [THIFENSULFURON-METHYL TECHNICAL; SUBN.#85-1188], DACO: 4.4.1
1203778	2-GENERATION, 4-LITTER REPRODUCTION STUDY IN RATS WITH INM-6316, DACO: 4.5.1
1203601	2-GENERATION, 4-LITTER REPRODUCTION STUDY IN RATS, DACO: 4.5.1
1203600	LONG TERM FEEDING STUDY IN RATS, DACO: 4.5.1
1203602	DEVELOPMENTAL TOXICITY STUDY IN RATS GIVEN INM-6316 BY GAVAGE ON DAYS 7-16 OF GESTATION, DACO: 4.5.2
1203603	INM-6316 DEVELOPMENTAL TOXICITY STUDY IN RABBITS DOSED BY GAVAGE ON DAYS 7-19 OF GESTATION, DACO: 4.5.2
1203605	CHO/HGPRT ASSAY FOR GENE MUTATION, DACO: 4.5.4
1203607	IN VIVO ASSAY FOR CHROMOSOME ABERRATIONS IN RAT BONE MARROW CELLS, DACO: 4.5.4
1203604	MOUSE MICRONUCLEUS ASSAY, DACO: 4.5.4
1203608	UNSCHEDULED DNA SYNTHESIS/RAT HEPATOCYTES IN VITRO, DACO: 4.5.4
1205244	MEDIAN LETHAL DOSE (LD50) IN RATS- EPA PROPOSED GUIDELINES, DACO: .6.1
1205245	ACUTE SKIN ABSORPTION LD50 TEST ON RABBITS..., DACO: 4.6.2
1205246	EYE IRRITATION TEST IN RABBITS..., DACO: 4.6.4
1205247	SKIN IRRITATION TEST ON RABBITS FOR EPA PESTICIDE REGISTRATION, DACO: 4.6.5
1205249	SKIN SENSITIZATION TEST ON GUINEA PIGS, DACO: 4.6.6
832424	DACO 5.2 - Use site /application description, N/S, MRID: N/S, DACO: 5.2
1203610	METABOLISM OF 14C-LABELLED DPX-M6316 BY MALE AND FEMALE RATS, DACO: 6.4
1203779	METABOLISM OF [THIOPHENE-2-14C] DPX-M6316 BY RATS, DACO: 6.4
1203780	METABOLISM OF [TRIAZINE-2-14C] DPX-M6316 IN MALE AND FEMALE RATS, DACO: 6.4
1176316	1997, ANALYTICAL METHODOLOGY, DACO: 7.2.1
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1233094	2004, Analytical Method for the Determination of Nicosulfurn, Thifensulfuron-methyl, Ethametsulfuron Methyl, Rimsulfuron, Tribenuron Methyl, and Chlorimuron Ethyl in Oily Crop Matrices using SPE Purification and LC/MS/MS Detection., Dupont 13412, DACO: 7.
1230095	A METHOD FOR ANALYSIS OF THE HERBICIDE, DPX-M6316 IN SOYBEANS BY LIQUID CHROMATOGRAPHY (AMR-973-87), DACO: 7.2.1
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1203611	ANALYSIS OF THE HERBICIDE DPX-M6316 IN WHEAT OR BARLEY GRAIN AND STRAW BY LIQUID CHROMATOGRAPHY, DACO: 7.2.1
1171280	ANALYSIS OF THE HERBICIDE, DPX-M6316 IN CORN FRACTIONS BY LIQUID CHROMATOGRAPHY. REVISION 3-AUGUST 11,1988. S.M.KENNEDY ET.AL., SEPTEMBER 2,1987. DPX-KV141 75DF, SUBMITTED:MAY 1,1997. SUB.NO.95-0476.(AMR-431-85;VOLUME 11;111A)., DACO: 7.2.1
1213819	ANALYSIS OF THE HERBICIDE, DPX-M6316 IN WHEAT OR BARLEY GRAIN AND STRAW BY LIQUID CHROMATOGRAPHY (AMR 235-84), DACO: 7.2.1
1156020	ANALYTICAL ENFORCEMENT METHOD (COLUMN SWITHCHING/HEART CUT) FOR THE DETERMINATION OF RESIDUES OF CHLORIMURON ETHYL (DPX-F6025) IN SOYBEAN (SEED) (AMR 2698-93) (CONCERT), DACO: 7.2.1
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1203784	Long-term feeding study in rats with 2-thiophene-carboxylic acid, 3-(((((4-methoxy-6-methyl-1,3,5-triazin-2-yl)-amino)carbonyl)amino)sulfonyl), methyl ester, (INM-6316). Haskell Laboratory Report No. 261-86. MR No. 4980-001. May 15, 1986.
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PMRA Document Number	Reference
942680	Closed-Patch repeated insult dermal sensitization study (Buehler Method) with IN M6316-25 in Guinea pigs (January 28, 1988). DER. MRID No. 409215-03. April 11, 1994.
942693	Primary eye irritation study in rabbits (November 16, 1987). DER. MRID No. 409215-01. August 13, 1992
	Primary dermal irritation study in rabbits (December 10, 1987). DER. MRID No. 409215-02. August 13, 1992.

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1441534	2003, Plant Metabolism, Independent laboratory method validation for chlorimuron ethyl, Analytical methodology for thifensulfuron-methyl, Freezer storage stability, DACO: 6.3,7.2,7.2.3,7.3
1441526	2001, Presubmission Consultation (D.3.1) Thifensulfuron-methyl (MMM) on Chicory Subn. No: M2000-1165, Summary and Conclussions, Minor Use of Pesticides Program Residue Trial Specifications Form, DACO: 6.3,7.4,Memo
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1441535	1995, Residues, label and analytical methodology for the product Pinnacle STS containing thifensulfuron-methyl for use on sulfonylure tolerant soybeans, DACO: 7.2,7.4
1441530	2001, Level C1 Preliminary Review for Deficiencies noted for Parts 1, 2, 3, 6, and 7 of Subn. No. 2001-0535, DACO: 7.2.2,7.3,7.5,Memo
1441532	2002, Urmule D.3.2 Review thifensulfuron-methyl (MMM) on tomatoes subn. no. M2001-1201, Freeezer Storage Stability data, Environmental Data, Processing Study, DACO: 7.3,7.4.5,8.6,Memo
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1441531	2002, Note to file - Promulgation of MRLs for commodities that are presently covered under 0.1 ppmn (subsection B.15.002(1)), DACO: 7.4,Memo
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1441524	Registration of a new end-use product DPX-KV141 75DF as a post-emergent herbicide for both grassy and broadleaf weed control in field corn grown in Eastern Canada, March 18, 1997.
1441523	The petitioner has applied for the registration(expansion in use) of the herbicide thifensulfuron-methyl (Refine, PCP 21059) alone and in a tankmix quizalfop-P-ethyl (Assure II, PCP 25462) on canola varieties containing the Smart Trait and CDC Triffid flax, September 28, 1998.
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1287432	1999, Photochemical Oxidative Degradation of Thifensulfuron-methyl, DuPont-3459, MRID: N/S, DACO: 8.2.3.3.3
1287437	1991, Water/Sediment Biodegradation of [Triazine-2-14C]Thifensulfuron-methyl, R 91/256; MTB-90-0032-02; 50604, DACO: 8.2.3.5.4
1287436	1992, Water/Sediment Biodegradation of [Thiophene-2-14C]Thifensulfuron-methyl, R91/255; MTB-90-0032-01; 50604, DACO: 8.2.3.5.4

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1287439	1994, A Lysimeter Study of the Leaching Behaviour of Thifensulfuron-methyl in Soil, AMR 1481-89, DACO: 8.2.4.3
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1287465	1986, Daphnia magna Static Acute 24 And 48-Hour EC50a Of INM-6316-20, HLR 258-86; MR NO. 4581-359, DACO: 9.3.2
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